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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/699,857	11/03/2003	Chi S. Wang	CSW-03-01	5136
29055	7590	12/15/2004	EXAMINER	
PHILIP H. KIER 321 HOME AVENUE OAK PARK, IL 60302			RIDLEY, BASIA ANNA	
			ART UNIT	PAPER NUMBER
			1764	

DATE MAILED: 12/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/699,857

Applicant(s)

WANG, CHI S.

Examiner

Basia Ridley

Art Unit

1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 14-17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 110303.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claim 1-13, drawn to an apparatus, classified in class 422, subclass 186.04.
 - II. Claims 14-17, drawn to a method, classified in class 48, subclass 197R.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another and materially different process, such for hazardous waste destruction.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.
5. During a telephone conversation with Mr. Philip Kier on 7 December 2004 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-13. Affirmation of this election must be made by applicant in replying to this Office action. Claims 14-17 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Information Disclosure Statement

6. The information disclosure statement filed on 3 November 2003 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each U.S. and foreign patent; each publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the following document referred to therein has not been considered as to the merits:

- Lias, Sharon G., Ionization Energies of Gas Phase Molecules, as only pages 10-181, 10-184, 10-186, 10-187 and 10-198 were included.

Specification

7. The disclosure is objected to because of the following informalities:

- [0004], last line, current status of patent application 10/121,390 should be included;
- page 2, line 22, formula "Electric power input = % of power output (H₂)" is not clear;
- [0007], first line, "(USDOE)¹" footnote explanation is missing, also, footnote "¹" is already used on page 2;
- page 4, line 3, "Spindt²" footnote explanation is missing, also, footnote "²" is already used on page 2;
- page 6, line 22, "increases³" footnote explanation is missing, also, footnote "³" is already used on page 2;
- examples of punctuation inconsistencies: "embedded in, the outer lateral walls" (page 5, line 28), "electrode(s).." (page 6, line 5), "the ceramic outer wall 28; provides thermal insulation; and maintains the system durability (...)" (page 9, lines 5-6); applicant's cooperation is requested in reviewing the disclosure and correcting any punctuation errors of which applicant becomes aware.

Appropriate correction is required.

Drawings

8. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: the symbol indicating center axis of the reactor in Fig. 1. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 4-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

11. Claims 4 and 7 recite alternative limitations in form of improper Markush group, and therefore said claims are indefinite. Proper Markush group recites its members as being "selected from the group consisting of: A, B, and C". See MPEP 2173.05(h).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 1 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang (USP 5,614,156) in view of Kieser et al. (USP 5,746,051) and further in view of Sakurai et al. (USP 5,744,104).

Regarding claims 1, Wang, in Fig. 1, discloses a plasma reformer for hydrogen production (C1/L47-52) comprising:

- a turbulent heating zone (35) containing porous articulated material (C3/L8-20) with a first impervious ceramic wall laterally bounding it (C3/L24-28);
- a reaction chamber (36) downstream from the turbulent heating zone (35);
- an energy retaining zone (27) containing porous articulated material arrayed downstream from the central reaction chamber (Fig. 1 and C3/L8-20);
- low thermal conductive material (29 and 30) surrounding the energy retaining zone (Fig. 1);
- a casing (31);
- means (33) for introducing gaseous material in a flow into the turbulent heating zone (35); and
- means (32) for removing reaction products from the energy retaining zone (27).

Wang (C3/L8-20) teaches turbulent heating and energy retaining zones comprising material that appears to be the same as, or an obvious variant of, the micro-porous articulated material, as set forth in the instant claims.

While Wang discloses the reaction chamber laterally bound by a first impervious ceramic wall (26) comprising means for generating plasma (Fig. 1-2, C3/L1-7 and C3/L64-C4/L51) and that disclosed reactor can be used for destruction of volatile pollutants (abstract), but the reference does not disclose said means for generating plasma comprising emitter electrode means attached to the first ceramic wall, an inner lateral wall containing collector electrode means, and an electric circuit maintained between the emitter electrode means and the collector electrode means.

Kieser et al. teaches effective means for generating plasma in a reactor used for destruction of volatile pollutants comprising emitter electrode means attached to the wall laterally bounding the reaction chamber, an inner lateral wall containing collector electrode means, and an electric circuit maintained between the emitter electrode means and the collector electrode means (Fig. 1).

As instant specification is silent to unexpected results, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the plasma generating means of Wang with plasma generating means of Kieser et al., because doing so would amount to nothing more than a use of a known apparatus for its intended use in a known environment to accomplish entirely expected result.

While Wang discloses the insulation in the thermoelectric reformer comprising a multiple composite layer of ceramic materials having very low thermal conductivities (Fig. 1 and C2/L62-66), the reference does not explicitly disclose a compression-expansion cushion mat material surrounding the low thermal conductive material.

Sakurai et al. teaches that it is known that when ceramic insulators are used they tend to crack or break easily (C9/L60-C10/L2). The reference solves the problem of said cracking by, among others, using of a compression-expansion cushion mat material (171) surrounding the ceramic insulator material (173). Such solution is shown in Fig. 17.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to add a layer of compression-expansion cushion mat material surrounding the low thermal conductive material, as taught by Sakurai et al., in the reactor of Wang, for the purpose of solving a known problem of cracking and breaking of the low thermal conductive material.

Regarding claims 12-13, Wang in view of Kieser et al., and further in view of Sakurai et al. disclose all of the claim limitations as set forth above. Additionally Wang discloses the reactor wherein:

- there are plural electric circuits connected to plural electricity sources (Fig. 1-2 and C2/L49-65);
- the means for continuously introducing gaseous material and the means for removing reaction products are double-walled tubes with a ceramic inner wall and a stainless steel outer wall (C4/L66-C5/L4).

Regarding limitations recited in claims 1 and 12-13 which are directed to a manner of operating disclosed reactor, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

10. Claims 2-8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang (USP 5,614,156) in view of Kieser et al. (USP 5,746,051), further in view of Sakurai et al. (USP 5,744,104), as applied to claim 1 above, and further in view of Tuck et al. (USP 6,097,139).

Regarding claims 2-3, Wang in view of Kieser et al. and further in view of Sakurai et al. disclose all of the claim limitations as set forth above, but the references do not explicitly disclose

said emitter electrode having a multiplicity of thin needle-like extrusions and any specific diameters of the needle-like extrusions.

Tuck et al. teaches an advantageous electron emitter substrate for use in plasma reactors (C3/L10-20) comprising needle-like extrusions having diameters between 1 nanometer and 10 micrometers (C3/L10-C6/L60, C8/L29-37 and Fig. 10a, 10b and 11). Further the reference teaches that said emitter means has improved performance and usability by having increased thermal conductivity and thermal stability (C7/L60-C8/L37).

It would have been obvious to one having ordinary skill in the art at the time of the invention to use the emitter electrode of Tuck et al. in the modified reactor of Wang for the purpose of improving thermal conductivity and thermal stability of said reactor.

Regarding claim 4, Wang in view of Kieser et al., further in view of Sakurai et al. and further in view of Tuck et al. disclose all of the claim limitations as set forth above. Additionally Tuck et al. discloses the reactor wherein:

- the emitter and collector electrode means are a metal selected from the group consisting of tungsten, zirconium, titanium, molybdenum and alloys thereof (C4/L44-49 and C12/L31-52).

Regarding claims 5 and 11, Wang in view of Kieser et al., further in view of Sakurai et al. and further in view of Tuck et al. disclose all of the claim limitations as set forth above.

Additionally Kieser et al. discloses the reactor further comprising:

- an ion neutralizing filter surrounding the collector electrode in the reaction chamber (C3/L38-46);
- wherein the ion neutralizing filter material is ceramic alloy (C3/L38-46).

Regarding claims 6-8, Wang in view of Kieser et al., further in view of Sakurai et al. and further in view of Tuck et al. disclose all of the claim limitations as set forth above. Additionally

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Wang discloses the reactor further comprising:

- a second ceramic wall (28) laterally surrounding the energy retaining zone (27) and inside of the low thermal conductive material (29 and 30);
- wherein the energy retaining zone (27) and turbulent heating zone (35) contain channel and porous structure layers selected from a group consisting of alumina, silica, mullite, titanate, spinel, zirconia, or some combination thereof (C3/L8-20);
- the low thermal conductive material (29 and 30) are vacuum form fibers (29) arrayed interior to fiber blankets (30), the vacuum form fibers having a greater density and a higher percentage of higher melting point material than the fiber blankets (C2/L55-57).

Regarding limitations recited in claims 2-8 and 11 which are directed to a manner of operating disclosed reactor, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang (USP 5,614,156) in view of Kieser et al. (USP 5,746,051), further in view of Sakurai et al. (USP 5,744,104), further in view of Tuck et al. (USP 6,097,139), as applied to claim 8 above, and further in view of 3M Designer's Guide for InteramTM Catalytic Converter Mat Product.

Regarding claim 9, while Wang in view of Kieser et al., further in view of Sakurai et al. and further in view of Tuck et al. do not explicitly disclose the reactor wherein the compression-expansion cushion mat material is low thermal conductive material, such materials were well

known in the art at the time of the invention.

3M Designer's Guide teaches that the most commonly used cushion mat material which is used for mounting ceramic substrates is an InteramTM Mat comprising low thermal conductive material (section 1-1 and 1-2). Said material additionally seals the reactor perimeter and provides thermal insulation.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use low thermal conductive material as a compression-expansion cushion mat material, as taught by 3M Designer's Guide, in the modified reformer of Wang, since doing so would amount to nothing more than a use of a known material for its intended use in a known environment to accomplish entirely expected result.

Regarding limitations recited in claim 9 which are directed to a manner of operating disclosed reactor, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang (USP 5,614,156) in view of Kieser et al. (USP 5,746,051), further in view of Sakurai et al. (USP 5,744,104), further in view of Tuck et al. (USP 6,097,139), as applied to claim 5 above, and further in view of Naeem (USP 6,197,267).

Regarding claim 10, Wang in view of Kieser et al., further in view of Sakurai et al. and further in view of Tuck et al. disclose all of the claim limitations as set forth above. Additionally

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Kieser et al. discloses the reactor wherein the ion neutralizing filter is alumina or catalytic material (C1/L65-C2/L33), but the reference does not explicitly disclose the reactor wherein the ion neutralizing filter material is semiconductor.

Naeem establishes equivalency of ion neutralizing filter materials which can be used for catalytic reactions for destruction of volatile pollutants, said materials including alumina and semiconductor materials (C1/L50-C2/L11). As instant specification is silent to unexpected results, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the ion neutralizing filter material in the modified reformer of Wang with semiconductor materials, since such modification would have involved a mere substitution of known equivalents. A substitution of known equivalents is generally recognized as being within the level of ordinary skill in the art.

Regarding limitations recited in claim 10 which are directed to a manner of operating disclosed reactor, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

Conclusion

14. In view of the foregoing, none of the claims are allowed.
15. The Group and/or Art Unit location of your application in the PTO has changed. To aid in correlating any papers for this application, all further correspondence regarding this application should be directed to Group Art Unit 1764.

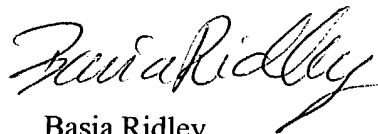
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16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Basia Ridley, whose telephone number is (571) 272-1453.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola, can be reached on (571) 272-1444.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Technical Center 1700 General Information Telephone No. is (571) 272-1700. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Questions on access to the Private PAIR system should be directed to the Electronic Business Center (EBC) at (866) 217-9197 (toll-free).



Basia Ridley
Examiner
Art Unit 1764

BR

December 10, 2004